Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-35 (cancelled).

Claims 36-53 (as originally presented)

Claims 54-88 (presented as original claims 1-35)

36. A corrosion sensor system comprising:

a reference module designed specifically for use in measuring the electrochemical potential of the surface of a tank;

a measuring module connected to said reference module for measuring the amount of protection current necessary for condition based monitoring and long term corrosion and coatings assessment;

an electronic module connected to said reference module for monitoring and storing potential and current data to allow for analysis of tank coatings degradation.

37. The corrosion sensor system of claim 36, whose reference module further comprises:

a small hermetically sealed non-metallic enclosure, which contains two cable interconnection connectors, a metallic threaded stud coupling for mounting and a 5-position connector for attachment of the reference sensing element.

38. The corrosion sensor system of claim 37, wherein the reference module includes a multiple plug-in module array having a single cable interconnection and interconnects variable module quantities and cable lengths for use in measuring the tank electro-chemical potential of a surface of a tank at various heights and with multiple sensor modules, using the two cable interconnection connectors.

39. The corrosion sensor system of claim 36, whose reference module determines the fill and empty operational cycle of the tank and used to document corresponding tank electrolyte depths concurrent with electro-chemical potential measurements.

Cl Cont

40. The corrosion sensor system of claim 36, whose reference module evaluates the growth of the calcareous deposits on the metal surface and surface corrosion based on the extent of polarization.

41. The corrosion sensor system of claim 36, whose measuring module further comprises:

a sacrificial metal which is electrically isolated from the tank structure using a rigid dielectric barrier and a connector to enable connection to the single interconnection cable.

42. The corrosion sensor system of claim 36, whose measuring module measures, in-situ, an

amount of protection current by measuring the voltage drop across a shunt resistor connected to the tank structure, thus providing a direct measurement of actual current necessary to protect the tank.

43. The corrosion sensor system of claim 36, whose measuring module current measurement are used to define a protection current requirement, which is supplied by the structure's cathodic protection galvanic anode system.

C1 Cont

44. The corrosion sensor system of claim 36, whose measuring module data, through direct calculation by Faraday's Law, predicts the condition of permanently installed cathodic protection anodes and the anticipated lifetime before exhaustion.

45. The corrosion sensor system of claim 36, whose electronic module further comprises:

an integral datalogger for data storage at the termination connection of the single interconnect cable.

46. The corrosion sensor system of claim 36, whose electronic module futher comprises a non-metallic enclosure which contains the datalogger, the location for the shunt resistor and connection for the hull grounding cable.

47. A corrosion sensor system of claim 36 capable of being utilized in seawater ballast tanks and compensated fuel tanks and, which can be utilized to indicate the relative location of coatings damage, tank protection polarization and prediction of galvanic anode system life, regardless of fuel properties.

48. A method for analyzing data acquired from the corrosion sensor system, comprising the step for:

Cl Cont

storing polarization data from the reference and measuring modules;

storing current data from the reference and measuring modules; and

combining said polarization and current data from the reference and measuring modules to define a specific range level indicating relative levels of coating damage and tank protection.

49. A method according to claim 48, wherein the step of combining further comprises:

ranking polarization levels of a tank into levels of,

less than –900 mV;

between -750 and -900mV; and

greater than -750mV.

50. A method, according to claim 48, wherein the step of combining further comprises:

ranking current levels of a tank into levels of,

less than 75mA;

between 75 and 175mA; and

greater than 175mA.

51. A method according to claim 48, further comprising:

performing trend analysis on said data from which, life-cycle maintenance decisions concerning long-term behavior and changes in the relative location of coatings damage, tank protection polarization

and performing prediction of galvanic anode system life to be monitored and documented in a condition based maintenance approach.

C1 Cont

52. A method of installing a corrosion sensor system comprising the steps for:

attaching metallic studs to the tank wall at desired module locations for support

attaching reference modules to the welded studs of the tank at various heights

attaching measurement modules near the bottom of the tank

attaching a non-metallic enclosure to either the underside of the tank access hatch or outside the tank at an accessible location

attaching a hull grounding cable to the tank structure or hull of ship or watercraft.

53. An installation method of the corrosion sensor system reference module and measuring module, according to claim 52, further comprising the steps for:

connecting a desired number of reference modules and measuring module to the single interconnect cable

connecting an interconnect cable to the non-metallic enclosure connector

installing a reference module "sensing element" into one of five locations provided on the reference cell module connector, as to indicate specific location with respect to other reference modules within the tank

programming the datalogger to incorporate the number of modules, sampling period and start date.

C1 Cont

54. An apparatus comprising:

a half cell measuring a potential of a tank, the measured potential indicating an amount of corrosion of the tank and the cathodic protection level of the tank.

55. An apparatus according to claim 54, said apparatus further comprising:

an anode measuring a current demand of cathodic areas of a tank, the current demand indicating the amount of corrosion of the tank and the level of coatings degradation.

56. An apparatus according to claim 54, wherein the indicated amount of corrosion is in one of at least two different ranges.

57. An apparatus according to claim 56, wherein a polarization corresponding to the measured potential is used to determine the amount of corrosion of the tank and the cathodic protection level of the tank.

58. An apparatus according to claim 57, wherein the polarization is above a specific level indicating that the amount of corrosion is in a first range of said one of at least two different ranges.

Cl Cont

59. An apparatus according to claim 57, wherein the polarization is within a specific level indicating that the amount of corrosion is between a first and second range of said one of at least two different ranges.

60. An apparatus according to claim 57, wherein the polarization is below a specific level indicating that the amount of corrosion is in a second range of said one of at least two different ranges.

61. An apparatus comprising:

an anode measuring a current demand of cathodic areas of a tank, the current demand indicating an amount of corrosion of the tank.

62. An apparatus according to claim 61, wherein the indicated amount of corrosion is in one of at least two different ranges.

63. An apparatus according to claim 62, wherein the measured current output is below a specific level indicating that the amount of corrosion is in a first range of said one of at least two different ranges.

C1 Cont

64. An apparatus according to claim 62, wherein the measured current output is within a specific level indicating that the amount of corrosion of the tank is between a first and second range of said one of at least two different ranges.

65. An apparatus according to claim 62, wherein the measured current output is above a specific level indicating that the amount of corrosion of the tank is in a second range of said one of at least two different ranges.

66. An apparatus according to claim 61, wherein the anode is a instrumented sacrificial anode which uses a type ZHC-24 zinc.

67. An apparatus comprising:

half cells measuring a potential which corresponds to a polarization of a tank; and

an anode measuring a current demand of cathodic areas of a tank, the polarization and the measured current demand together indicating an amount of corrosion of the tank and the level of coatings degradation.

68. An apparatus according to claim 67, wherein the indicated amount of corrosion is in one of at least two different ranges.

C1 Cont

69. An apparatus according to claim 68, wherein the polarization is above a specific level indicating that the amount of corrosion is in a first range of said one of at least two different ranges.

70. An apparatus according to claim 68, wherein the polarization is within a specific level indicating that the amount of corrosion is between a first and second range of said one of at least two different ranges.

71. An apparatus according to claim 68, wherein the polarization is below a specific level indicating that the amount of corrosion is in a second range of said one of at least two different ranges.

72. An apparatus according to claim 68, wherein the measured current demand is below a specific level indicating that the amount of corrosion is in a first range of said one of at least two different ranges.

73. An apparatus according to claim 68, wherein the measured current demand is within a specific level indicating that the amount of corrosion is between a first and second range of said one of at least two different ranges.

C1 Cont

74. An apparatus according to claim 68, wherein the measured current output is above a specific level indicating a condition in which an amount of corrosion is in a second range of said one of at least two different ranges.

75. An apparatus according to claim 69, wherein the specific level is more negative than -900mV.

76. An apparatus according to claim 70, wherein the specific level is between -750 and -900mV.

77. An apparatus according to claim 71, wherein the specific level is less negative than -750mV.

78. An apparatus according to claim 72, wherein the specific level is less than 75mA.

79. An apparatus according to claim 73, wherein the specific level is between 75 and 175mA.

80. An apparatus according to claim 74, wherein the specific level is more than 175mA.

81. A method comprising:

measuring a potential which corresponds to a polarization of a tank; and

measuring a current output of an instrumented sacrificial anode, the polarization and the measured current output together indicating an amount of corrosion of the tank and the level of coatings degradation.

C1 Cont'

82. An apparatus comprising:

first means for measuring a potential which corresponds to a polarization of a tank; and

second means for measuring a current output of an instrumented sacrificial anode, the polarization and the measured current output together indicating an amount of corrosion to the tank and the level of coatings degradation.

83. A method as in claim 81, further comprising:

comparing said amount of corrosion of the tank with amounts of corrosion in other tanks, and

determining which of said tanks requires maintenance.

84. A method as in claim 83, further comprising:

scheduling tanks for maintenance based on compared amounts of corrosion in said tanks.

85. An apparatus as in claim 54, further comprising:

a second half cell for measuring a potential of said tank,

wherein said half cell and said second half cell measure potential at different levels of a tank.

86. An apparatus as in claim 85, further comprising:

a data storage device for storing said current output and said potential measurements.

87. An apparatus as in claim 86, further comprising a tank level indicator.

88. A method for determining whether a tank requires maintenance comprising:

measuring a potential which corresponds to a polarization of a tank during the filling episode of a tank,

Cl Cont

measuring a current output of an instrumented sacrificial anode during the filling episode of a tank

comparing said potential and said current output with preset levels to determine whether a tank requires maintenance.